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DISEASES OF RUBBER IN CEYLON, 1931

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1. FOREWORD

THIS article is the third of a series of annual reviews whose purpose is to keep planters in touch with the general position of Rubber diseases and pests in Ceylon, and to acquaint them briefly of any important developments during the year in question.

2. ROOT AND COLLAR DISEASES

There are no new developments to report for 1931. At the present time, when expenditure on all items must be reduced to the bare minimum, it is more than ever important that such money as is voted under "Pest and Disease" account should be utilized to the best advantage. On the great majority of estates in the main low-country districts the most dangerous disease is *Fomes lignosus*, and every effort should be made to prevent the spread of this fungus. Only the most thorough measures, involving the removal of all diseased roots and infected material, will prevent the spread of the disease, and it is emphasised that the treatment which eradicates the disease once and for all from any particular area is the cheapest in the long run. When once large areas become involved, the control of the disease is an exceedingly difficult and expensive undertaking.

The next most important fungus in mature areas is *Ustulina zonata*, and, inasmuch as this fungus develops to an alarming extent if neglected, it is important that the treatment of root, collar, and stem attack should receive adequate attention. In order to prevent fresh infection by the spores borne on the surface of young fructifications, it is advisable, before removing tissue on which whitish and light grey fructifications have formed, to paint these over with tar or disinfectant.

3. STEM DISEASES

In common with other *Phytophthora* diseases Bark Rot was somewhat severe in many districts during the protracted South-West Monsoon. Although present methods of controlling this

disease cannot be considered perfect, the measures adopted on most estates are effective in preventing the worst manifestations.

Canker can be safely neglected on the majority of estates except where the actual tapping panels are affected. During dry weather tappers should be encouraged to flake off the dead bark from any canker patches within reach of the ground.

Die-back of leading twigs and branches has been much in evidence on poor washed-out soils. In nearly all cases the dying-back is primarily due to lack of cultivation and measures for the conservation of water and surface soil. There is a host of weakly parasitic fungi which are unable to attack fully healthy twigs, but which can parasitise and kill back shoots whose water or food content is reduced below a certain level. The dying-back is often most marked on estates which made liberal applications of inorganic manure two or three years ago to soils deficient in humus, but which are now unable to continue manuring. The die-back may be regarded as the tree's natural efforts to restore the balance between the foliage and the mineral food substances coming from the roots. The soil having reverted to its former condition of comparative sterility, the additional foliage produced as the result of the manure can no longer be supported. Unless a virulent parasite gains entrance the die-back will continue until the quantity of foliage remaining is "balanced" by the nourishment derived by the root system.

It would be a counsel of perfection in such areas to recommend the removal of all dead branches, resume a regular manuring programme, and by the establishment of cover crops and silt-pits restore the fertility of the soil so that the application of artificial manures will be of more permanent benefit. At the present time, however, it is questionable to what extent the outlay involved in improving poor areas will ever be repaid.

4. LEAF DISEASES

Owing to the unusually protracted wet weather during the South-West Monsoon, secondary leaf-fall due to *Phytophthora palmivora* (*P. Faberi*) was comparatively severe in most districts. Although it is possible that with the cessation of manuring and other measures of cultivation the damage done by this disease during the next few years will be more severe than usual, there is at present no reason to fear that direct control measures will have to be adopted.

Oidium leaf disease is firmly established in all districts, but only at mid-country elevations is the defoliation serious. Experiments carried out in Matale have shown that both yield and bark renewal are seriously affected by intensive attacks over a number

of years, but that a high degree of control can be secured by sulphur dusting so that the yield is maintained at a normal level.

5. DISEASES AND PESTS IN NURSERIES

The possession by most estates of budwood nurseries for the multiplication of high-yielding clones has focussed attention on the various ailments to which young rubber plants are prone.

Although there are fortunately no new diseases or pests to report, considerable damage has been done by attacks of *Phytophthora palmivora* on green shoots. In common with other *Phytophthora* affections, this disease was favoured by the almost continuous wet weather experienced in most districts from May to September. The disease has been described in previous publications and the symptoms are now well known to most planters, but it is not out of place to reiterate the necessity for periodical applications of Bordeaux Mixture during wet weather, especially during the period of the South-West Monsoon. Attacks of this fungus on the woody portions of bud-shoots, causing a type of Canker, have also been reported. It is of interest to note that Clone B.D. 5 appears to be extremely susceptible to this disease.

Pests in nurseries include mites, slugs, and lizards.

6. DISEASES OF GREEN MANURES

Sclerotium Rolfsii was found attacking *Crotalaria usaramoensis* and *Crotalaria* (*angustifolia?*) on an estate in the Kalutara District. In both cases the plants were rapidly killed.

THE INFLUENCE OF *OIDIUM* AND SULPHUR DUSTING ON YIELD AND BARK RENEWAL

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1. FOREWORD

IN previous reports [1, 2, 3, 4] it has been shown that in certain districts in Ceylon *Oidium* leaf disease causes an extremely severe defoliation during the period immediately following the annual "winter", and that in areas subjected to recurrent attacks of this severity die-back of twigs and branches is a characteristic feature indicating a depletion of food reserves consequent upon the abnormal leaf-fall. Furthermore, it has been demonstrated that by means of dusting with sulphur powder this defoliation can be almost entirely prevented. Although the treatment could be recommended in the most severely affected areas by reason of the improvement in foliage alone, from a practical standpoint the ultimate criterion of the value of sulphur dusting, as of any other prophylactic or agricultural measure, must be yield per acre. This report gives the results up to the 31st December, 1931, of the yield records kept in dusted and control fields on Kandanuwara Estate, Matale, where most of the work on the control of *Oidium* has been undertaken.

2. PREVIOUS INFORMATION

There has hitherto been a conspicuous lack of precise information regarding the influence of *Oidium* and its control measures on yield. When the disease first became serious there could be little doubt that the cumulative effects of constant abnormal defoliation would deplete the tree of food reserves and eventually cause it to yield less latex. In practice, however, the yield of severely affected areas was maintained to a surprising extent.

There have been many general references to decrease of yield due to *Oidium*, but in very few cases have actual figures been quoted. In East Java, as the result of an enquiry carried out by Reydon [5] in 1927, the proportion of affected estates which also reported a decrease in yield was only 6·4%, despite the fact that 37·6% of the estates reported dying-back of twigs

due to the disease. As the result of an experiment carried out on an estate in Java in 1928-29, Dopheide [6] found that the average yield per tree per tapping of 207 slightly diseased trees exceeded the yield of 96 severely infected trees by 3·27 grams.

As regards the influence of sulphur dusting on yield, Ament [7], writing of the Malang district of Java, states that on two out of four estates dusted with sulphur against mildew increased yields of 22% and 14% respectively were recorded. It is pointed out, however, that these figures should be accepted with reserve, since the less productive parts of the estates were selected as controls.

3. THE SULPHUR DUSTING OPERATIONS

Detailed particulars of the sulphur dusting experiments on Kandanuwara Estate have been given in previous reports [2, 4], but for the sake of completeness they are briefly summarised below.

Throughout the experiments only one field has been treated. This is a field of 30 acres of well-grown mature Rubber at an elevation of about 2,000 ft; it was considered particularly suitable for the work owing to its partial isolation from neighbouring Rubber. The trees were originally planted 30 ft. × 12 ft., and the number per acre is now 91. The area selected as a control is a portion of an adjacent field adjoining the dusted field at one end. The lie of land and direction of the slope is similar in the two fields, though the gradient is somewhat steeper in the control area. The planting distance in the latter is approximately 18 ft. × 15 ft., the number of trees per acre averaging 126. Before sulphur dusting was undertaken the two fields had suffered to an equal extent from *Oidium* attack since 1925, the defoliation being severe in 1927 and successive years.

The first dusting work was carried out from January to March, 1930, as the result of which the foliage of the dusted field was markedly better than that of the control. Owing mainly to the operations being started too late there was a proportion of trees, however, which had already lost the young leaf before the dusting was commenced. Further treatment was given during the following wintering period, i.e., December, 1930, to March, 1931, and leaf-fall was almost entirely prevented. Whereas the majority of trees in the control area had suffered complete defoliation, the dusted field presented a very fair appearance.

In 1930 a total of 53 lb. of sulphur per acre was applied at an inclusive cost of about Rs. 7-00 per acre; in 1931 the quantity of sulphur used per acre was 85 lb., and the cost Rs. 11-00. It is emphasised that these costs are proportionately high owing

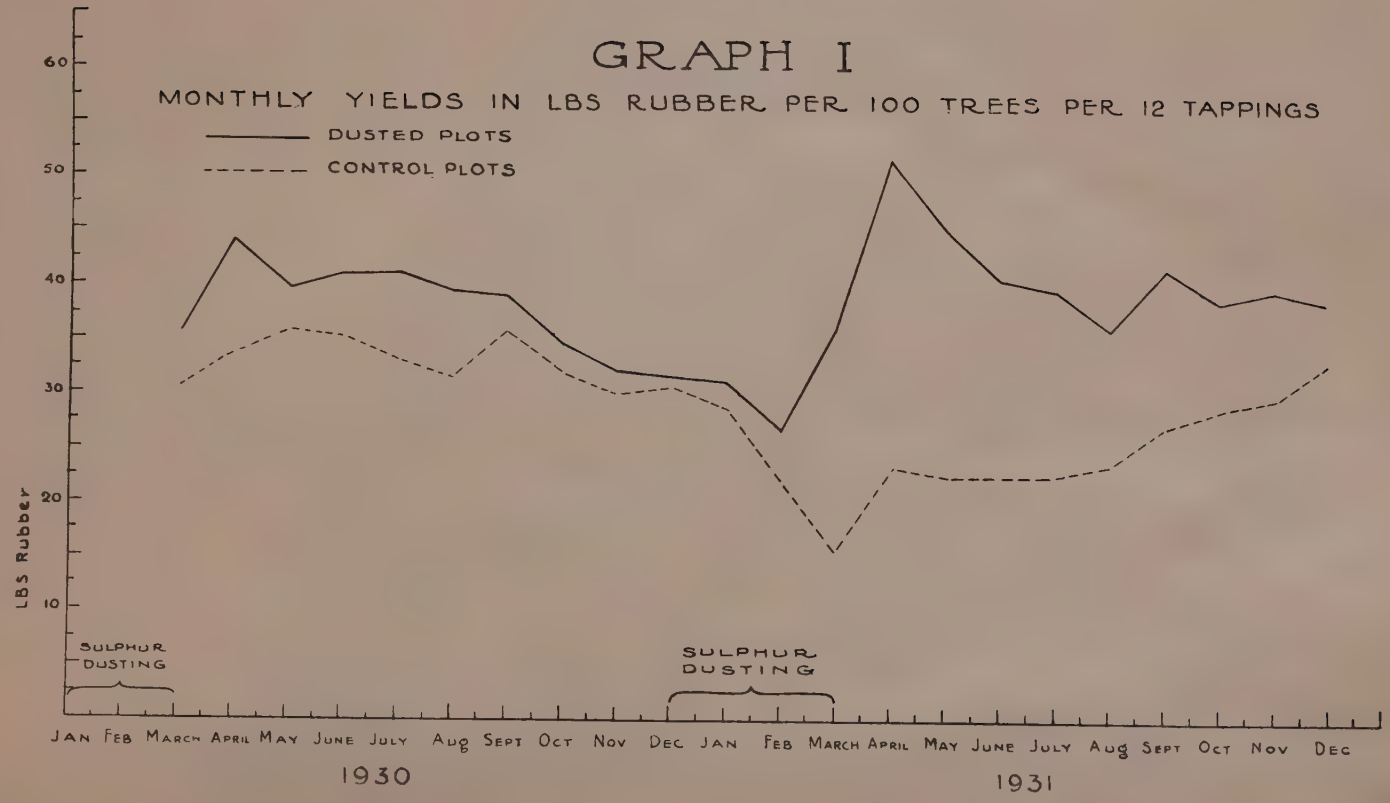
to the small area treated, and it is estimated that on an estate scale the cost of the work in 1931 would have been about Rs. 9-00 per acre.

4. YIELD RECORDS

(a) *Experimental Methods.*—Yield records have been kept in the dusted and control fields since March, 1930, the method being as follows:

Ten square plots containing 16 trees each were marked out in the dusted field, and a similar series in the control field. These were arranged according to a definite formula so that when one plot had been marked the position of the remainder was pre-determined and not selected. The distance between the plots is arranged so that as far as possible every portion of each field is represented. The fields are tapped on alternate days ($\frac{1}{2}$ spiral cut) by the same tapper, the latex being brought in and measured separately for each plot. Until February, 1931, a daily Metrolac reading was taken of the bulked latex from the 10 plots of each field, and the weight of dry rubber calculated from this reading and the latex measurements. This method, however, seemed insufficiently accurate, and from the 1st February, 1931, onwards duplicate 100 c.c.s. samples have been prepared and coagulated at weekly intervals from each field, and the coagulum dried and weighed. The quantity of dry rubber yielded each month is calculated from the total latex yield and the average rubber content as determined by the weekly trial coagulations. Days on which any appreciable rainfall has occurred between the commencement of tapping and the completion of collection are not taken into account.

The yield determinations are thus taken from one tapping task in each field, but this task is divided into ten plots scattered "at random" throughout the field. It is assumed that the summation of the yields from these ten plots is representative of the field as a whole. The arrangement will admittedly not bear the light of statistical scrutiny, but owing to the nature of the treatment and the small area of land available, it was impossible to arrange treated and control plots in accordance with statistical requirements. The method adopted has the advantage that the human tapping factor is eliminated, and at the same time the work is on a sufficiently small scale to enable careful supervision to be exercised.


GRAPH I
MONTHLY YIELDS IN LBS RUBBER PER 100 TREES PER 12 TAPPINGS
DUSTED PLOTS
CONTROL PLOTS
LBS Rubber
60
50
40
30
20
10
SULPHUR DUSTING
SULPHUR DUSTING
JAN FEB MARCH APRIL MAY JUNE JULY Aug SEPT OCT NOV DEC JAN FEB MARCH APRIL MAY JUNE JULY Aug SEPT OCT NOV DEC
1930
1931

(b) *Results.*—In order to avoid a confusing mass of figures the yields are not given for each separate plot but for the sum of the ten plots in each field. Owing to the fact that there is a monthly variation in the number of tapping days, and an occasional change in the number of trees tapped, the actual yields from month to month would not be readily comparable. The monthly yields have therefore been reduced to a standard figure of 100 trees per 12 tappings per month. It must be understood, however, that the number of trees actually tapped in each field is 140-160, and the number of tappings per month varies from 7-15 The monthly figures from March, 1930, to December, 1931, are given in Table I, and shown graphically in Graph I.

Before considering the total annual yields a study of the monthly variation will be of interest. Reference to the graph will show a striking correlation between yield and condition of foliage. The majority of the trees "winter" during January and February and, were it not for *Oidium* attack, would have fully grown new foliage by March or April. Referring first to the dusted plots, we see the expected increase in yield during March and April as the trees recover from the depressing effect of wintering. This is more marked in 1931 than in 1930 owing to the greater success of the treatment in the former year. In both years the dusting was discontinued in March, and during the subsequent months *Oidium*, though not causing any appreciable defoliation, was responsible for severe "secondary" attack on mature leaflets. This deterioration of the foliage is accompanied by a gradual decrease in yield until the next wintering period.

The development of the foliage is greatly different in the control area. The young leaf produced in January and February is attacked by the fungus and most of it falls to the ground. Thus in March the field is actually barer of leaf than at any time during the normal "winter". This is strikingly represented in 1931 by a fall in yield to the minimum in March. During the remaining months of the year the intensity of *Oidium* attack gradually lessens, and the fungus is almost passive from about September to December. The trees in the control area are therefore able to recover their foliage to a considerable extent, and by the time the next "winter" is due the foliage is not so greatly inferior to that of the dusted trees. This is represented in both 1930 and 1931 by a gradual equalisation of the yields from the two areas.

Table 1

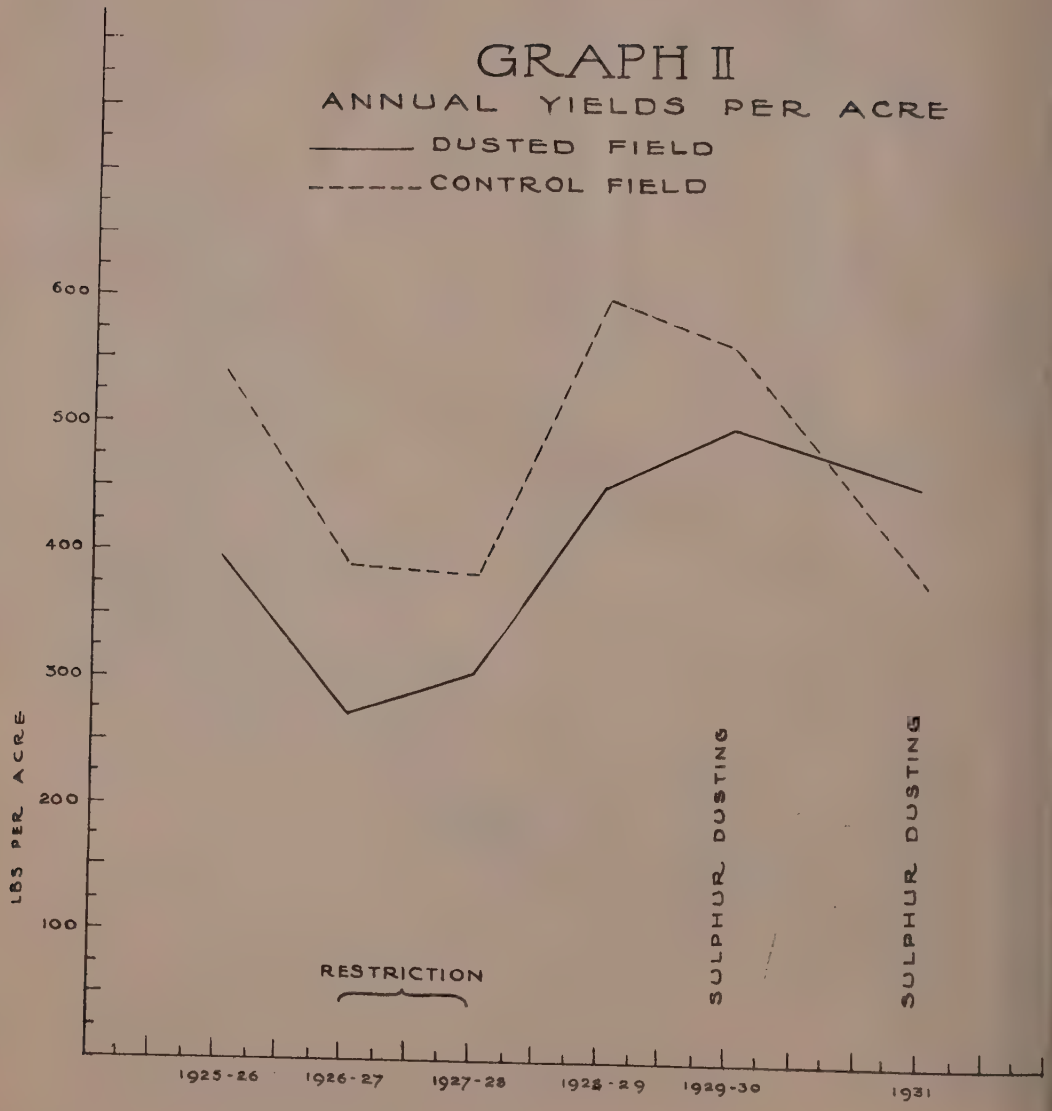
Monthly yields in lbs. of dry rubber (to nearest ½ lb.) per 100 trees per 12 tappings.

Month	Dusted Plots	Control Plots
March 1930	35·5	30·5
April ..	44·0	33·5
May ...	39·5	35·5
June ...	41·0	35·0
July ...	41·0	33·0
August ..	39·5	31·5
September ...	39·0	35·5
October ...	34·5	32·0
November ..	32·0	30·0
December ..	31·5	30·5
Total for 1930 (10 months)	377·5	327·0
January 1931 ..	31·0	28·5
February ...	26·5	22·5
March ...	36·0	15·5
April ...	51·5	23·0
May ..	45·0	22·5
June ...	40·5	22·5
July ...	39·5	22·5
August ..	36·0	23·5
September ..	41·5	27·0
October ..	38·5	28·5
November ..	39·5	29·5
December ...	38·5	33·0
Total for 1931	464·0	298·5

It is therefore evident that apart from the more permanent benefits to the well-being of the trees conferred by the sulphur dusting, there is an immediate yield response to the treatment.

In order to compare the total yields obtained in 1930 and 1931 the average yield per tree per tapping in the two fields has been calculated for the period March to December in each year. The months January and February, 1931, are excluded since the yields for these months were not kept in 1930. The figures are shown in Table II. The number of tappings is comparatively small owing to the exclusion of all wet days.

The figures show that the average yield per tree per tapping in the dusted field has increased by ·06 oz. (1·7 grams), whereas the yield in the control field has decreased by ·11 oz.


GRAPH II
ANNUAL YIELDS PER ACRE
DUSTED FIELD
CONTROL FIELD
600
500
400
300
200
100
LBS PER ACRE
RESTRICTION
SULPHUR DUSTING
SULPHUR DUSTING
1925-26
1926-27
1927-28
1928-29
1929-30
1931

(3·1 grams). This amounts to a nett increase of the dusted over the control field of ·17 oz. (4·8 grams) per tree per tapping. To express the figures in percentages: in 1930 the yield of the dusted plots was 16% greater than that of the control plots, whereas in 1931 it was 75% greater.

A comparison of the yields in 1930 and 1931 is not altogether a fair criterion of the value of the sulphur dusting treatment, since dusting was carried out in 1930, albeit with moderate success. It is unfortunate that yields prior to the treatment were not kept, but a certain amount of information can be obtained from the estate yields of the two areas in question. The estate figures of annual yield per acre for the two fields since the year 1925-26 (July 1st-June 30th) are given in Table III and are represented graphically in Graph II. The yields for 1931 (January 1st-December 31st) are also given and have been calculated from the yield records, the total number of tappings being brought up to 150, and the number of trees per acre in the two fields being taken from a census (see Section III above).

Table II

	1930 (March to December)				1931 (March to December)			
	Total yield	Average number of trees	Number of tappings	Average per tree per tapping	Total yield	Average number of trees	Number of tappings	Average per tree per tapping
	Lbs.				Lbs.			
Dusted Plots	591	154	123	·50 oz.	595	152	112	·56 oz.
	513	154	123	·43 oz.	343	151	112	·32 oz.

Table III

Yield per acre in lbs. dry rubber.

Year	1925-26	1926-27	1927-28	1928-29	1929-30	1931
Dusted Field	397	272*	305*	449	499†	454
Control Field	541	391*	382*	600	564†	384

* Restricted Crop. † 10 Months' Tapping.

The comparison of the estate figures with the experimental results for 1931 must be accepted with a certain reserve since the estate yields from the control field cover an area of 44 acres, whereas only about half this area is represented by the experimental plots. The whole field is, however, fairly uniform in character, and there is no reason to suppose that any large error is introduced.

It is abundantly clear from the above figures that as the result of the sulphur dusting the yield per acre of the dusted field has been maintained, whereas that of the control field, which was formerly the higher on account of the greater number of trees per acre, has fallen very considerably. It is not possible to represent this benefit by an exact figure expressed in lbs. of rubber per acre, but an approximation may be reached by comparing the yield in 1931 with that in 1928-29, the last complete year of tapping before the experiments were commenced. Such a comparison would indicate a relative increase of 221 lb. per acre in favour of the dusted field. A comparison with the yield in 1925-26 shows a similar figure (214 lbs.). Although it is emphasised that a strict comparison is not valid, there can be no doubt that a difference of this order of magnitude is directly attributable to the treatment.

5. BARK RENEWAL

Measurements of the thickness of the renewing bark were taken from 129 trees in the dusted field and 100 trees in the control field. The measurements were taken on the 24th November, 1931, the bark tested having been tapped in the previous March. A small plug of bark was taken from each tree with a special instrument graduated in millimetres at the cutting end. The plug was in each case taken at a definite height, about $4\frac{1}{2}$ inches, measured above the centre of the tapping cut with a small stick.

The average thickness of the renewing bark of the dusted trees was found to be 3·2 mms, and of the control trees 2·3 mms. These figures represent the bark renewal in the dusted field to be 39% better than in the control field.

The comparison must be regarded as indicative rather than absolute by reason of the rather inaccurate method of measurement. Moreover it is not possible to affirm that the difference in bark thickness is wholly due to the sulphur dusting; the density of planting is greater in the control field, and therefore, other things being equal, a somewhat slower rate of bark renewal might be expected. There can be no doubt, however, that the bark renewal has been appreciably benefited by the improved foliage due to the sulphur dusting treatment.

6. DISCUSSION

With a permanent field crop such as Rubber the value of a leaf disease treatment must be regarded, not so much in the light of an immediate yield response, but in so far as it maintains the normal health of the tree and prevents it from debilitation due to the disease. The results given in this paper show that sulphur dusting, if carried out on an area which has been subjected to severe attacks of *Oidium* for some years, achieves both these objects. Under the circumstances in which the experiments were carried out, the influence of this control measure on yield appears to be twofold:

(1) There is an immediate yield response due to the improved canopy of foliage, in so far as the yield of the dusted trees is maintained at a normal level while that of the untreated trees falls during the worst period of abnormal defoliation. The yield of the control field, indeed, follows the course that would be expected were the wintering period to last four instead of two months. This is strikingly represented in Graph I for the yields in March and April, 1931.

(2) The improved bark renewal and general health of the tree is certain to be reflected in a permanent benefit in yield as compared with an untreated area. The experiments on Kandanuwara Estate have not yet been carried out for a sufficiently long period for this benefit to be manifested.

As regards the immediate yield response it has been shown that the benefit due to the sulphur dusting may be expressed as an increase in yield per acre during 1931 of the order of 200 lbs. This increase must be regarded to some extent as due to the cumulative effects of the two years' treatment. The total cost in the two years was about Rs. 18 per acre, and a simple calculation will show that with rubber selling at only -/15 cents per lb., the increased yield due to the treatment has more than covered the expense thereof.

It is important to note that although the control field has been subjected to severe abnormal defoliation since the wintering season of 1927, the yield only began to show a serious decline in 1930-31. This is probably in part due to the beneficial effects of restriction in 1926-28. Estates which have experienced severe attacks for the past two or three years, but whose yields have as yet shown no decline, must therefore soon expect a shortage in crop unless control measures are adopted.

To the question "Is sulphur dusting a paying proposition?" an affirmative answer can definitely be given in the case of the most severely affected areas. (This presumes the retention of

the Rubber as a paying crop, the advisability of which in these days involves other issues). The question as to whether the treatment should be adopted on more mildly affected estates must await the outcome of further experience, and is, of course, largely dependent on the selling price of rubber.

In considering the results described above a cautionary word must be added. The comparative gain in yield due to the sulphur dusting has only been evidenced as yet for one year, and it would be wise to await the results of further records before evaluating the treatment in terms of pounds of rubber per acre.

7. ACKNOWLEDGMENTS

The courtesy of the Warriapolla Estates Company, Limited, in permitting these experiments to be carried out on their property, and the helpful co-operation of Mr. M. C. Evans, Superintendent of Kandanuwara Estate, are gratefully acknowledged.

8. SUMMARY

(1) Information available from Java regarding the influence of *Oidium* and sulphur dusting on yield is briefly summarised.

(2) A brief account is given of the sulphur dusting operations carried out in 1930 and 1931 on Kandanuwara Estate, Matale. In 1930 the results were promising but not entirely satisfactory, but in 1931 the dusting was more successful and defoliation due to *Oidium* was very largely prevented.

(3) The methods adopted in recording the yields of dusted and control fields on this estate are described.

(4) A comparison of the monthly yields in 1931 from the two areas shows that, as the result of the retention of the young foliage, the yield of the dusted field recovered normally after the wintering period, whereas in the control field the abnormal defoliation caused a further depression in the yield. The yield and foliage of the control area, however, showed a gradual recovery throughout the last six months of the year.

(5) The total yields recorded from the experimental plots in 1930 and 1931 (March-December in each year) are compared. They show that whereas in 1930 the average yield per tree per tapping was 16% higher in the dusted than in the control plots, in 1931 the yield was 75% higher.

(6) The yield per acre in 1931 from the two fields is calculated from the plot yields and the known number of trees per acre. A comparison of these figures with the estate figures

for yield per acre in previous years indicates that the sulphur dusting has been responsible for a nett increase of about 200 lbs. per acre per annum. It is pointed out, however, that the comparison is not strictly valid, and that this figure must be accepted with reserve.

(7) Measurements of bark renewal indicate that the average thickness of 8 months' renewing bark is about 39% greater in the dusted than in the control field.

(8) The economic significance of sulphur dusting as a control measure against *Oidium* is discussed. It appears that under the conditions obtaining on Kandanuwara Estate the relative gain in yield of a dusted as compared with an untreated area is twofold:

(a) An immediate yield response due to the retention of the young leaves produced after wintering. Under the circumstances in which the experiments were carried out this increased yield is sufficient to cover the cost of the treatment with rubber at -/15 cents per lb.

(b) A more permanent benefit due to the maintenance of a normal foliage and a normal rate of bark renewal.

(9) The conclusion is reached that on severely affected estates sulphur dusting is not only a necessary measure if the health of the trees is to be maintained, but also shows a quick return on the money expended.

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NOTES ON BUDGRAFTING

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ALTHOUGH budgrafting is now a process which has almost passed from the domain of special technical work into the realm of normal estate procedure, there is yet considerable diversity in the details of the technique adopted by different budders. Most of these variations have been employed experimentally on the Rubber Research Scheme Experiment Station, Nivitigalakele, and it is thought that a brief account of the conclusions reached might be of interest.

CUTTING THE STOCK PANEL

There is a certain amount of variation in the shape and size of the panel cut on the stock for the insertion of the bud-patch. Three types may be distinguished:

(1) Rectangular panel of such a size that the bud-patch fits closely at sides and top end.

(2) Rectangular panel about 1 inch longer than the bud-patch, and cut so as to leave about $\frac{1}{8}$ inch space on each side of the latter.

(3) As No. 2, but with the top of the panel tapered to a point like a Gothic arch.

An experiment was carried out in a well-grown one-year-old seedling nursery at the Experiment Station to test the respective merits of methods Nos. 1 and 3. Sixty stocks were budded by each method, other details being balanced. There was not a single failure amongst the 120 buddings, indicating that, within limits and under the favourable conditions in which the budding was carried out, the shape and size of the stock panel in relation to that of the bud-patch is not a factor of *primary* importance in determining the success of the operation.

Under less favourable conditions, however, there would appear to be certain advantages, and no disadvantages, accrueing to the long stock flap as described under methods (2) and (3) above. These advantages are outlined below. They are not purely theoretical, for it is significant that the budding successes secured at the Experiment Station have increased considerably both in the field and in the nurseries since adopting the long tapered panel as described under method (3).

(a) When removing the flap prior to inserting the bud-patch the cambium of the stock is inevitably touched by the spatula, resulting in slight injury at the top end and sometimes at the sides of the panel. With a close fitting patch this damaged portion of the stock cambium may come in contact with the edge of the bud-patch, and the latter may, therefore, not "take". When the stock panel is considerably longer and broader than the bud-patch the latter is placed with its top edge at least $\frac{3}{4}$ inch from the top of the panel, so that the whole of the patch is in contact with healthy cambial tissue. This argument applies with the greater force when the budder is somewhat clumsy or the bark difficult to peel.

(b) The top of the stock flap fits back neatly into its original position, and affords a convenient place for the budder to hold the flap while the graft is being bandaged. The budder must otherwise place his finger over the bud-patch, which may thus be subjected to uneven pressure and the possibility of movement.

(c) In the event of water getting through the bandage the flap whose top fits flush with the stock will clearly give greater protection to the bud-patch than the flap whose upper edge stands out from the stock. In this connection the tapered flap is considered to have a slight advantage over the rectangular flap since there is no horizontal crack in which the water can settle. Field experience with ordinary waxed cloth, which is not impervious to the heaviest rain, has shown that in wet weather the long tapered flap is definitely better than the short rectangular flap.

(d) The fact that the top portion of the flap fits back immediately into its original position helps to keep the flap alive. Indeed, when cutting off the flap at the first examination, it is usually possible to retain the upper portion in the stock.

REMOVING THE BUD-PATCH

At the Experiment Station the bud-lifter designed by R. A. Taylor and sold by Messrs. Hunter & Co., Colombo, is always used for removing the bud-patch except when the budwood does not peel readily. By the use of this instrument the bud-patch is removed in one motion, and there is no need to remove any wood or to trim the patch. Once the use of this instrument has been mastered the process of removing and preparing the bud-patch is rendered foolproof, and a considerable saving in time is affected. The size of the bud-lifter formally employed was $1\frac{1}{2}$ inch by $\frac{3}{4}$ inch, but this has now been replaced by an instrument which cuts a bud-patch 2 in. long by $\frac{5}{8}$ in. broad. The narrower tool is considered more satisfactory as wasting less buds.

Where large stocks are budded and coir rope used for binding, a patch made by sticking two or three pieces of the rubberised tape together can be recommended in place of the ordinary square patch of waxed cloth.

It is now believed that when bandaging the stock with waxed cloth very tight binding throughout is advantageous. Theoretically it is preferable to relax the pressure slightly over the bud itself but this does not appear to be borne out in practice. It is certain that more failures are due to loose than to tight bandaging.

TREATMENT OF CUT STOCKS

It is very important, particularly with large stocks, that the cut end should be protected against wood-rotting fungi. Tar was formerly recommended for this purpose, but this has now been replaced on the Experiment Station by a mixture of asphalt and kerosene. The grade of asphalt used is Mexphalte, DX Grade. This is heated and an equal part of kerosene mixed in. The cooled mixture has a consistency rather thicker than oil paint, and is easily applied with the finger or a piece of coconut husk. This mixture is preferred to tar on account of being more elastic and less liable to crack.

The procedure recommended below is based on the instructtions issued by the Rubber Research Institute of Malaya, to whom due acknowledgment is made.

After the final examination of the budding the stock should be cut back with a sloping cut to within about 6 inches of the level of the bud-patch. On the day following pruning the cut surface should be covered with a layer of the asphalt-kerosene mixture. When the bud shoot shows about 3 feet of brown bark the snag must again be pruned with a cut sloping slightly away from the shoot. The level at which this second pruning should take place is marked by an external ridge of tissue which represents the limit of the live portion of the stock. Immediately after the pruning the cut surface should be painted with a 10% solution in water of Brunolinum Plantarium or similar water-miscible disinfectant. On the following day the surface is fully covered with the asphalt-kerosene mixture as before. It is important that the protective layer be maintained until the callusing over is completed, and on very large stocks it may be necessary to renew the application.

RUBBER RESEARCH SCHEME (CEYLON)

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Diseases of Rubber in Ceylon, by R. K. S. Murray, A.R.C.Sc., Mycologist.